HSLA-65 WELDMENT CHARACTERIZATION

Status: Transitioned

PROBLEM / OBJECTIVE

A new commercially available structural steel with 65 ksi yield strength, HSLA-65, can be used to replace high strength steel (HSS), 51 ksi yield strength, currently used for naval ship construction. The improved strength level will allow an increase in design stresses and reduction in plate thickness and, thus, a savings in hull weight.

The objectives of this project are to permit NAVSEA certification and implementation of HSLA-65 for naval ship construction by (1) defining the welding procedure limits for joining HSLA-65 with potentially undermatching strength welding consumables currently used for HSS, (2) determining the effects of various fabrication practices on the properties of HSLA-65 (flame straightening, cold and hot forming, re-normalizing, high-heat-input welding, and post-weld stress relieving) that are currently approved for HSS, and (3) proposing changes to the fabrication standards, if needed, to provide allowable limits for the fabrication practices.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The NCEMT teamed with Northrop Grumman Newport News (NGNN) and domestic steel producers to obtain HSLA-65 plates and to fabricate weldments at both NGNN and NCEMT using a range of shipyard processes and procedures. High-heat-input weldments were also fabricated by National Steel and Shipbuilding. The other fabrication practices were performed by the NCEMT. The results were shared with shipyards and the Naval Sea Systems Command (NAVSEA) for use by the technical codes and Program Offices in other new surface ship and submarine designs.

Implementation and Technology Transfer:

NAVSEA has certified HSLA-65 for naval ship construction. NGNN has initiated implementation of HSLA-65 in the hull of the CVN-78 aircraft carrier.

Expected Benefits:

- The project results showed that HSLA-65 can be used to replace HSS and can be welded, with some restrictions, using existing welding procedures and consumables. HSLA-65 can also be used with the other fabrication practices certified for HSS, with slight modifications.
- NGNN has determined that 2/3 of the HSS used in aircraft carriers could be replaced with HSLA-65, with a corresponding weight saving of 2,400 tons of steel. The Navy CVN-76 aircraft carrier design team has determined that the reduced material and fabrication costs and reduced ship weight could result in a $24 million total life cycle savings per CVN ($10K per ton of weight savings) if HSLA-65 was used for non-critical secondary structures. If used for primary hull and secondary structures for other ship designs, the estimated material and life-cycle savings are: CVX = $125M/ship, SC-21 = $25M/ship, and Arsenal Ship = $12M/ship.

TIME LINE / MILESTONE

Start Date: July 1994
End Date: March 1997

FUNDING

Total ManTech Investment: $1.4M
Cost Share: None

PARTICIPANTS

- Oregon Steel Mills
- National Steel and Shipbuilding
- Northrop Grumman Newport News
- Naval Surface Warfare Center, Carderock Division
- National Center for Excellence in Metalworking Technology